

CUYAHOGA VALLEY NATIONAL PARK

Programmatic Environmental Assessment for Riverbank Management of the Cuyahoga River

3.0 ALTERNATIVES

The CEQ has provided guidance on the development and analysis of alternatives under NEPA. A full range of alternatives, framed by the purpose and need, must be developed for analysis for any federal action. They should meet the project objectives, at least to a large degree. They should also be developed to minimize impacts to environmental resources. Alternatives should also be “reasonable,” which CEQ has defined as those that are economically and technically feasible, and show evidence of common sense. Alternatives that could not be implemented if they were chosen (for economic or technical reasons), or that do not resolve the need for action and fulfill the stated purpose in taking action to a large degree, are therefore not considered reasonable.

3.1 Alternative 1 - No Action Alternative

The CEQ has specified that one of the alternatives must be the “no action” alternative, which is defined as the continuation of present management actions, for two reasons. One is that it is almost always a viable choice in the range of alternatives, and the other is that it sets a baseline of existing impact that may be projected into the future against which to compare impacts of action alternatives.

Under the No Action Alternative, the threat of riverbank erosion on the resources of CVNP would be managed as it is now (see Table 3-1). Measurements of riverbank recession, obtained through the Riverbank Erosion Monitoring Program, would continue to be used to develop and update a priority listing of repair sites. Direct measures would continue to be implemented only when the Towpath Trail or Valley Railway is in immediate danger of being damaged or destroyed due to fluvial geomorphologic processes. No other cultural features, including archaeological sites would be protected. On average, 2 to 3 projects a year are expected until all HIGH and MODERATE concern areas are repaired. It is anticipated that all of the sites listed as LOW will become HIGH or MODERATE during the implementation period, and that new sites will be added to the list. The implementation period is therefore expected to extend for a period of 25 years. Measures would be limited to those that repair the bank immediately adjacent to the threatened feature, and would typically consist of a riprap toe constructed to approximately mean annual flood elevation, and a variety of bioengineering measures above that point to



Riprap toe with willow stakes.

the top of the eroded bank. Where erosion moves too close to the Towpath Trail or Valley Railway before riverbank stabilization measures can be constructed, fencing would be installed to protect staff and visitors until such construction can be accomplished. Construction of direct measures may require the removal of healthy hardwood trees and shrubs on the banks. This alternative would not include indirect measures to address potential future threats from riverbank erosion.

A description of the riprap to be used is found in Section 1.2.2. Additional description of the techniques used under this alternative is available in Appendix I. An analysis of the NRI segment of the river for this alternative is provided in Appendix H.

Table 3-1. No Action Alternative (Alternative 1) – Conditions, Riverbank Assessment and Recommended Actions.

Condition	Riverbank Assessment	General and Specific Recommended Actions
A	Riverbank Erosion Monitoring Program encroachment risk ratings are LOW or MODERATE (top of eroding bank is > 10 ft. from the resource) and the susceptibility to erosion ratings are LOW or MODERATE (rate of erosion is less than 1ft./yr.).	Monitor The Site, Apply No Corrective Actions Specifically: 1. Identify changes/additions to the mechanisms of bank loss. 2. Continue direct measurements at a 6-month frequency.
B	Riverbank Erosion Monitoring Program encroachment risk ratings are LOW (top of eroding bank is > 20 ft. from the resource) and the susceptibility to erosion ratings are LOW to HIGH (rate of erosion is zero to greater than 1ft./yr.).	Monitor The Site, Apply No Corrective Actions Specifically: 1. Identify changes/additions to the mechanisms of bank loss. 2. Continue direct measurements at a 6-month frequency.
C	An existing repaired site that is being flanked by active erosion or that is experiencing some distress. This could include undermining at the toe of the existing repair or displacement of the repair itself. Riverbank Erosion Monitoring Program encroachment risk ratings and susceptibility to erosion ratings are LOW to HIGH.	Repair or Extend an Existing Repair Evaluate the feasibility of relocating the Towpath Trail or other feature (see Condition E). Otherwise, apply direct measures from the following list to protect the resource: 1. At gabion repair sites, design new riprap and use plant materials to replace or supplement the gabion structure. 2. At riprap repair sites, design new riprap section and use plant materials above the riprap as appropriate. 3. At any site, evaluate the potential for using riprap spurs, bendway weirs, engineered log jams or other suitable measures to augment existing protection. 4. Ensure that existing structures are adequately keyed into the bank or transitioned to naturally hardened zones along the bank. 5. At sites that require extension of an existing repair that is performing well, design new riprap and use plant materials above the riprap as appropriate. 6. For extensions of existing riprap repairs, utilize trenchfill or windrow type installations, as appropriate.

Table 3-1. No Action Alternative (Alternative 1) – Conditions, Riverbank Assessment and Recommended Actions.

Condition	Riverbank Assessment	General and Specific Recommended Actions
D	Riverbank Erosion Monitoring Program encroachment risk ratings are HIGH (top of eroding bank is < 10 ft. from the resource) and the susceptibility to erosion ratings are MODERATE to HIGH (rate of erosion is greater than 0.5 ft./yr.).	<p>Apply Direct Measures</p> <p>Evaluate the feasibility of relocating the Towpath Trail or other (see Condition E). Otherwise, apply direct measures from the following list to protect the resource:</p> <ol style="list-style-type: none"> 1. Riprap toe to approximately the dominant discharge elevation and plant materials above, as appropriate. 2. Riprap spurs anchored to the resource and aligned according to the channel plan form and stream characteristics. 3. Bendway weirs anchored to the resource and aligned according to the channel plan form and stream characteristics. 4. Riprap or tree vanes. 5. Engineered log jams. 6. Mechanical stabilization of the bank through soil retention and drainage.
E	Riverbank Erosion Monitoring Program encroachment risk ratings are HIGH (top of eroding bank is < 10 ft. from the resource) and the susceptibility to erosion ratings are HIGH (rate of erosion is greater than 1 ft./yr.).	<p>Relocate Feature</p> <p>Evaluate the feasibility of relocating the Towpath Trail or other feature without causing an adverse effect on the resources. The majority of the towpath is in its original alignment. The locations where it is not in its original alignment include a section from Boston to Peninsula (see Figure 4) and a section from Ira Road to the south end of the Park boundary (see Figure 1). The Valley Railway is in its historic location throughout the Park, and therefore cannot be relocated.</p>

3.2 Alternative 2 – Riverbank Management Alternative (Preferred Alternative)

The Riverbank Management Alternative provides a holistic and pro-active approach to managing the threat of riverbank erosion on the resources of CVNP from the Cuyahoga River and its tributaries. The current Riverbank Erosion Monitoring Program would be expanded under this alternative to provide more measures with which to monitor the threat of riverbank erosion. In addition to constructing engineered measures for the highest priority projects, a larger number of less intrusive, engineered and non-engineered measures would be implemented at locations where the progress of riverbank erosion has not yet presented an imminent threat to the Towpath Trail, Valley Railway, or other feature but is expected to threaten these resources in the future. In addition to the Towpath Trail and Valley Railway, significant archaeological sites and other cultural features would be added to the monitoring program and Riverbank Management Program. Many of these measures can be implemented by the Maintenance staff with direction from the Engineering staff, and have minimal environmental impacts, as compared to direct measures alone. Some measures have the potential to offer environmental enhancements to CVNP.

Table 3-2 identifies five possible riverbank assessment conditions (A, B, C, D, and E) based on an October 2002 site investigation (see Appendix B), and recommends a suite of actions to evaluate and/or apply for each condition. The conditions are listed in increasing order of concern or risk to the resource (Valley Railway or Towpath Trail), with A being the lowest and E being the greatest. The risk is based on the proximity of the resource to the riverbank and the rate of recession of the riverbank.

The riverbank assessment is presently based solely on the ongoing findings of the Riverbank Erosion Monitoring Program, where the distance from edge of the eroding riverbank to steel pins set between the top of riverbank and the resource are measured approximately every 6 months. Under the Riverbank Management Alternative, these measurements will continue to be made at 6-month intervals and after major floods (10% annual probability or less). The Riverbank Management Alternative will also expand the Riverbank Erosion Monitoring Program to include some or all of the following as appropriate: (1) the use of current and historic aerial photographs and multiple regression relationships to track and predict changes in the channel migration patterns; (2) hand-held Global Positioning System (GPS) measurements displayed on a Geographic Information System (GIS); and (3) cross-section measurements to assess potential for or occurrence of bank failures. This expansion of the Riverbank Erosion Monitoring Program is intended to provide a more comprehensive and accurate assessment of the riverbank that incorporates the trends of riverbank meanders to migrate outward and in the downstream



Debris jam upstream of Sta. 1107+00 (RM 28.61).

direction. The expansion of the monitoring program will not only assist in determining which condition a site falls under but will be used to continue development of the park's understanding of the ultimate causes of erosion. As part of the Riverbank Monitoring Program, an annual summary report of findings will be submitted to the Superintendent and natural resource staff by the first of September to coincide with the funding requests for the following fiscal years. The report will include a section which will identify the ultimate cause(s) of the erosion or the reasons why no loss has been seen, distinguishing between man-influenced versus natural activity. The evaluation will be conducted by experienced park staff through visual observation at the site, review of past data from the monitoring stakes, aerial photos, and GPS measurements. As new tools become available, such as computer modeling, they will be utilized as appropriate. In the case of Condition C, where an existing repair is adjacent to a particular monitoring site, the riverbank assessment will also include a visual assessment of the integrity of the existing bank protection measures, and the presence and severity of flanking and/or undermining. A summary of existing repairs will be included in the annual report to track the effectiveness of different designs.



Debris jam upstream of Fitzwater Road Bridge (RM 17.25)

Cuyahoga Valley National Park has developed a plan for establishing riparian buffers adjacent to watercourses within the Park boundaries (NPS, 2002a), which would establish or maintain buffers adjacent to agricultural areas that are to be farmed or mowed. The recommendation for the Cuyahoga River is a base buffer width of 120 feet. The recommendations also include:

- Additional width based on slope: Add 2 feet to the base width for each 1% of slope.
- Exclude impervious surfaces and slopes greater than 25%: Buffers are extended by the width of these areas as they do not provide effective buffer function.
- Include adjacent wetlands: Wetlands should be included within riparian buffers but are also not counted as part of the base riparian buffer width. Wetlands near the outer edge of established riparian buffers should also be buffered to ensure that wetlands are protected. Buffers to wetland areas should follow protocols outlined in the CVNP Wetland Protection Plan for Agricultural Lands (NPS, 2002b).
- Restore buffer zones: After designating buffer areas, the restoration of forest, shrub and herbaceous layers may be required due to the poor current condition of the buffer area. A Riparian Restoration Plan will need to be developed to implement these improvements.

The Riverbank Management Alternative presumes implementation of the Riparian Buffer Plan (NPS, 2002a) to all areas along the Cuyahoga River and not just to those areas adjacent to agricultural areas.

Certain techniques and materials that will not be used for protection of the Towpath Trail or Valley Railway under the Riverbank Management Alternative include pre-cast concrete blocks or articulated mattresses, gabions, sheet piling, and concrete retaining walls. Only natural materials, such as rock, plantings, and large woody debris, will be visible following construction of these measures.

A more detailed discussion of the techniques is available in Appendix I. An analysis of the NRI segment of the river for this alternative is provided in Appendix H.

Table 3-2. Riverbank Management Alternative (Alternative 2) – Conditions, Riverbank Assessment and Recommended Actions.

Condition	Riverbank Assessment	General and Specific Recommended Actions
A	Riverbank Erosion Monitoring Program encroachment risk ratings are LOW or MODERATE (top of eroding bank is > 10 ft. from the resource) and the susceptibility to erosion ratings are LOW or MODERATE (rate of erosion is less than 1ft./yr.).	<p>Monitor The Site, Apply No Corrective Actions</p> <p>Specifically:</p> <ol style="list-style-type: none"> 1. Identify changes/additions to the mechanisms of bank loss. 2. Continue direct measurements at a 6-month frequency. 3. Supplement with review of historic and most recent aerial photography referenced to GIS combined with multiple regression relationships to predict changes, following methods prescribed in NCHRP 24-7 (see Appendix B). 4. Supplement with GPS data referenced to GIS showing bankline recession trends. 5. Obtain cross-sections at certain locations, as necessary to assess the potential for or the occurrence of a bank failure.
B	Riverbank Erosion Monitoring Program encroachment risk ratings are LOW (top of eroding bank is > 20 ft. from the resource) and the susceptibility to erosion ratings are LOW to HIGH (rate of erosion is zero to greater than 1ft./yr.).	<p>Evaluate and Apply Indirect Measures</p> <p>Specifically:</p> <ol style="list-style-type: none"> 1. Collect woody debris and root wads. Ground this material at the toe of channel bank up to the dominant discharge elevation. 2. Plant deep rooting trees between top of channel bank and the resource. 3. Plant live stakes and posts on upper portion of cut banks above the dominant discharge elevation. 4. Where woody debris has become grounded or jammed, and is redirecting flows into the riverbank, reconfigure the debris to direct flow away from the riverbank. 5. Construct engineered log jams to encourage relocation of the low flow channel away from the resource. 6. In order to preempt bank erosion failures, cut trees, greater than 9 inches in diameter (leaving the roots in place), that are either greater than 50% undercut, or are tilted more than 45° towards the river, and plant 6 live stakes or posts above the dominant discharge elevation to help revegetate the bank. 7. Evaluate the encouraging of channel cutoffs (chutes) to reduce future risk to the resource. 8. Improve bank drainage in instances where this is a contributing factor to bank loss. 9. Evaluate the reestablishing of meanders that have formerly been cut off. 10. Construct longitudinal peaked and longitudinal stone fill protection with stone-fill tiebacks as necessary, and supplement with live stakes on the upper portion of the cut banks. 11. Apply any of the Condition D techniques, as appropriate.

Table 3-2. Riverbank Management Alternative (Alternative 2) – Conditions, Riverbank Assessment and Recommended Actions.

Condition	Riverbank Assessment	General and Specific Recommended Actions
C	An existing repaired site that is being flanked by active erosion or that is experiencing some distress. This could include undermining at the toe of the existing repair or displacement of the repair itself. Riverbank Erosion Monitoring Program encroachment risk ratings and susceptibility to erosion ratings are LOW to HIGH.	<p>Repair or Extend an Existing Repair</p> <p>Evaluate the feasibility of relocating the Towpath Trail or other feature (see Condition E). Otherwise, apply direct measures from the following list to protect the resource:</p> <ol style="list-style-type: none"> 1. At gabion repair sites, design new riprap and use plant materials to replace or supplement the gabion structure. 2. At riprap repair sites, design new riprap section and use plant materials above the riprap as appropriate. 3. At any site, evaluate the potential for using riprap spurs, bendway weirs, engineered log jams or other suitable measures to augment existing protection. 4. Ensure that existing structures are adequately keyed into the bank or naturally hardened zones along the bank. 5. At sites that require extension of an existing repair that is performing well, design new riprap and use plant materials above the riprap as appropriate. 6. For extensions of existing riprap repairs, utilize trenchfill or windrow type installations, as appropriate.
D	Riverbank Erosion Monitoring Program encroachment risk ratings are HIGH (top of eroding bank is < 10 ft. from the resource) and the susceptibility to erosion ratings are MODERATE to HIGH (rate of erosion is greater than 0.5 ft./yr.).	<p>Apply Direct Measures</p> <p>Evaluate the feasibility of relocating the Towpath Trail or other (see Condition E). Otherwise, apply direct measures from the following list to protect the resource:</p> <ol style="list-style-type: none"> 1. Riprap toe to approximately the dominant discharge elevation and plant materials above, as appropriate. 2. Riprap spurs anchored to the resource and aligned according to the channel plan form and stream characteristics. 3. Bendway weirs anchored to the resource and aligned according to the channel plan form and stream characteristics. 4. Riprap or tree vanes. 5. Engineered log jams. 6. Mechanical stabilization of the bank through soil retention and drainage.

Table 3-2. Riverbank Management Alternative (Alternative 2) – Conditions, Riverbank Assessment and Recommended Actions.

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3.3 Options For Obtaining Dormant Live Cuttings

Both alternatives include direct measures for bank stabilization, which will utilize the technique of constructing a riprap toe to an elevation between the mean and dominant discharge elevation with a combination of bioengineering measures above that point to the top of the repaired bank. The options for obtaining dormant live cuttings necessary for these measures are discussed in detail below.

3.3.1 Harvesting Cuttings From Nearby Construction Sites

This option would allow plants which would otherwise be disposed of or destroyed, to either be bought or donated from local construction sites. Intense coordination and preplanning with other agencies or persons would be needed to identify construction projects and ensure that plants are not diseased and are the proper species. The project schedules would have to be coinciding to ensure that cuttings are harvested at the proper time of year (late November to mid March) and so that no cold storage is required. If cold storage were required, it would significantly increase the project cost. CVNP's contractor would have to exhibit special care not to delay the other project, inadvertently cause a cost increase, or violate conditions of any permits. It is feasible for this alternative to work independently when time and availability permit.



Harvesting willow and dogwood cuttings within the Park for bioengineering measures

3.3.2 Purchasing Cuttings from an Outside Source

This option was evaluated as the “No Action” alternative in the 1996 EA (NPS, 1996). It stipulated that plant materials would have to be purchased from commercial or government nurseries and that no harvesting would occur within the park. The following points, which still hold true, were made in 1996:

- Desired plant species may not be available from commercial nurseries because nurseries have had little experience growing many of the native plants because of the lack of demand.
- Quantities may be insufficient even if suitable species are grown.
- Available plants may not have been propagated from seeds or vegetative materials collected from climatic areas similar to that of the project. This could result in the loss of genetic integrity if plants were purchased out of state, or from another watershed.

- Significant costs could be added to the stabilization contracts if plant material needed to be purchased.

3.3.3 Continued Use of Existing Harvesting Locations Within the Park

This option would allow for areas located on CVNP property to be used as harvesting sites for dormant live cuttings. Six areas were identified and evaluated for harvesting in the “Environmental Assessment for Riverbank Stabilization at Towpath Trail Stations 515+00, 530+00, 573+00, and 940+00”. These areas were Redlock, Stanford, Pleasant Valley, Indigo Lake, Ira, and Wetmore. Use of multiple areas allows for rotation of the sites. Access would be limited to small pick-up trucks traveling on existing trails and roads. Only foot traffic would be permitted off developed access routes. Only shrub branches with a diameter of 1/2 inch to 2 inches would be selected. Harvesting may be permitted up to the edge of the towpath. When harvesting is occurring, the vehicles must be parked on the side of the towpath and some work must be done at the vehicle. Therefore, the potential for conflicts with the public exists. However, harvesting occurs in the dormant season (late November to mid March) and not at high visitor use times. Shrubs would be selectively pruned, leaving approximately sixty percent of the living tissue to ensure proper regeneration of new branches and prevent death of the plants. Branch size would range in length from 18 inches to 7 feet. Larger trees would not be pruned. Once harvested, cuttings would be installed within a few days eliminating the need for long term cold storage. A significant cost saving to the government would result if plant material were harvested from the park instead of purchased commercially. Harvesting within the park ensures that the same genetic strains of plants are used along the riverbank, thus ensuring genetic integrity of the park’s flora.

3.4 Alternatives Considered but Rejected

As previously mentioned, alternatives should be “reasonable.” Unreasonable alternatives should be eliminated before impact analysis begins. Unreasonable alternatives may include those that are unreasonably expensive; that cannot be implemented for technical or logistical reasons; that do not meet NPS mandates; that are inconsistent with carefully considered, up-to-date NPS statements of purpose and significance or management objectives; or that have severe environmental impacts (DO-12 Handbook).

3.4.1 Repair and Restore Features Only After a Damaging Flood

Under this alternative, the NPS would repair and restore the Towpath Trail, Valley Railway, or other recreational feature only after a damaging flood event that either washed out or undermined the facility so as to make it unsafe or impassible. Although this alternative may delay the expenditure of monies and resources, it is not expected to reduce the number of locations where engineered measures will need to be constructed. Construction costs under this alternative are expected to be significantly greater than with either the No Action Alternative or the Riverbank Management Alternative, because the repair measures would be far more extensive (involving towpath and track reconstruction in addition to bank stabilization); would typically involve a greater length of bankline; and would be designed and constructed under emergency contracts.

Also, since adequate planning time is not feasible, funds may not be available for repairing areas for several years. Access to sections of the Towpath Trail, Valley Railway or other recreational feature would be temporarily closed to visitors for longer periods of time while the repairs are being constructed, than with either the No Action Alternative or the Riverbank Management Alternative. The emergency nature of these projects may also necessitate implementation at times of the year that are adverse to the establishment of riparian vegetation, limiting the available alternatives.

3.4.2 Provide No Riverbank Stabilization Measures

This alternative would provide no preemptive riverbank stabilization measures or post-flood repairs to the Towpath Trail, Valley Railway or other recreational feature. While this alternative partially accomplishes the objective of preserving the values of the Cuyahoga River, its tributaries and its floodplain by allowing the natural processes of scour and deposition to continue unabated, it significantly diminishes the historic and recreational values of the Towpath Trail and Valley Railway. Moreover, the sediment processes on the Cuyahoga River and its tributaries cannot be regarded as naturally occurring given the level of development within the basin, and that exotic and invasive plant species will colonize many of the new deposits. As discussed in Appendix B, the Cuyahoga River is presently in an altered state due to man-induced actions. Implementation of this alternative would result in the severing, isolating and eventual closing of the Towpath Trail and Valley Railway.

3.4.3 Provide Continuous Protection of the Towpath Trail and Valley Railway

This alternative would attempt to eliminate the possibility of future riverbank erosion of the Towpath Trail and Valley Railway by constructing a continuous riprap toe and bank protection along the river side of both features for the entire length of Cuyahoga River and tributaries within CVNP. This alternative would require riprap toe and bank protection along 19.5 miles of the Towpath Trail between the Lock 39 and Indian Mound trailheads, and 12.5 miles of the Valley Railway between Rockside Road and approximately MP 52. Although this alternative would largely accomplish the objective of protecting these culturally and recreationally important features, it is not economically feasible, with the cost in the order of magnitude of over \$100 million, and may not effectively address some of the mechanisms of bank loss. Also, it would have significant temporary impacts on terrestrial and aquatic resources and a potential for long-term impacts. While this alternative allows many of the Cuyahoga River's processes to continue, it would alter the sediment yield characteristics and the local habitat conditions and would limit some system dynamics. It is therefore unreasonable to provide continuous protection of these valued features.

3.5. Environmentally Preferred Alternative

The environmentally preferred alternative is the alternative that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historic, cultural, and natural resources. When identifying the environmentally preferred alternative, economic, recreational, and technical issues are not considered. The environmentally preferred alternative is the alternative that will promote the national environmental policy expressed in NEPA (Section 101(b)) as the alternative that will help the Nation:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
4. preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice;
5. achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The differences between the two alternatives are indistinguishable in meeting the first objective of the national environmental policy as expressed above.

For the second objective, both alternatives assure safety, health, productivity and culturally pleasing surroundings. The Riverbank Management Alternative (Alternative 2) has the potential to be more aesthetically pleasing since it includes the application of less intrusive, indirect measures to slow and possibly arrest riverbank erosion. This would be more aesthetically pleasing than the case of Alternative 1, where riverbank erosion would be allowed to occur to the point of threatening one of the cultural resources being protected, at which time only direct measures could be applied. The Riverbank Management Alternative is also deemed to result in a safer condition because it will address riverbank erosion before it reaches the resource.¹

Both alternatives aspire to the widest range of beneficial uses of the environment without degradation or risk to health and safety. By addressing potential areas of risk earlier, the Riverbank Management Alternative lowers the risk of undesirable and unintended consequences. For example, a flood event with unusually high flows could change the course or rate of erosion from the Cuyahoga River suddenly, inflicting damage on a nearby cultural resource. Such damage is less likely to occur in the case of the Riverbank Management Alternative, where measures are taken to minimize riverbank erosion before the river is close enough to the resource to be a threat. In addition, Alternative 2 seeks to identify and restore or preserve important riparian resources that can concurrently reduce erosion threats and enhance the environmental character of the Cuyahoga system. The Riverbank Management Alternative, therefore, is better at meeting the third objective.

¹ See Sections 5.11, Impacts on Human Health and Safety and 5.12, Impacts on Visitor Use/Experience.

Both alternatives are intended to meet the forth objective. Because of the greater flexibility of the Riverbank Management, the natural aspects of the Cuyahoga River and its tributaries, and the diversity in the area protected through more indirect means will be greater.² This leads to an improved balance between population and resource use (in the fifth objective) for the Riverbank Management Alternative.

The use of more indirect methods in the Riverbank Management Alternative makes better use of renewable resources (vegetation, use of woody debris, and use of other natural materials).

The Riverbank Management Alternative is therefore the environmentally preferred alternative. By means of its flexibility, it allows for the application of less intrusive, indirect measures to slow and possibly arrest riverbank migration that is in proximity of the Towpath Trail, Valley Railway and/or other resources, but is not immediately adjacent to it. Although some direct measures will still be required, the extent of their application may eventually be reduced or at least delayed by the use of the more flexible approach. This alternative is therefore the best balance of preserving the historical, cultural and natural aspects involved in CVNP.

² The following sections conclude that Alternative 2 may be expected to have less adverse impact with regard to the diversity of natural resources than Alternative 1: 5.1, Impacts on Water Quality; 5.2, Impacts on Wetlands; 5.4, Impacts on Floodplains; 5.5, Impacts on Terrestrial Habitat, Vegetation and Invasive Species; 5.6, Impacts on Aquatic Habitat; 5.8, Impacts on Wildlife and 5.9, Impacts on Natural River Processes.